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(54) Condenser with integral receiver dryer

(57) A condenser (10) having an integral receiver dryer includes a first manifold (12), a second manifold (14), and a plurality of fluid carrying tubes (16) extending between and in fluid communication with the first manifold (12) and second manifold (14). The condenser (10) also includes a receiver dryer (35) disposed in and integral with one of the first manifold (12) and second manifold (14). The first manifold (12) or the second manifold (14) is formed as a stamping having a generally arcuate shaped side extending axially and an edge of the side (24) overlapping the side to form an interior chamber (30) to receive fluid therein.

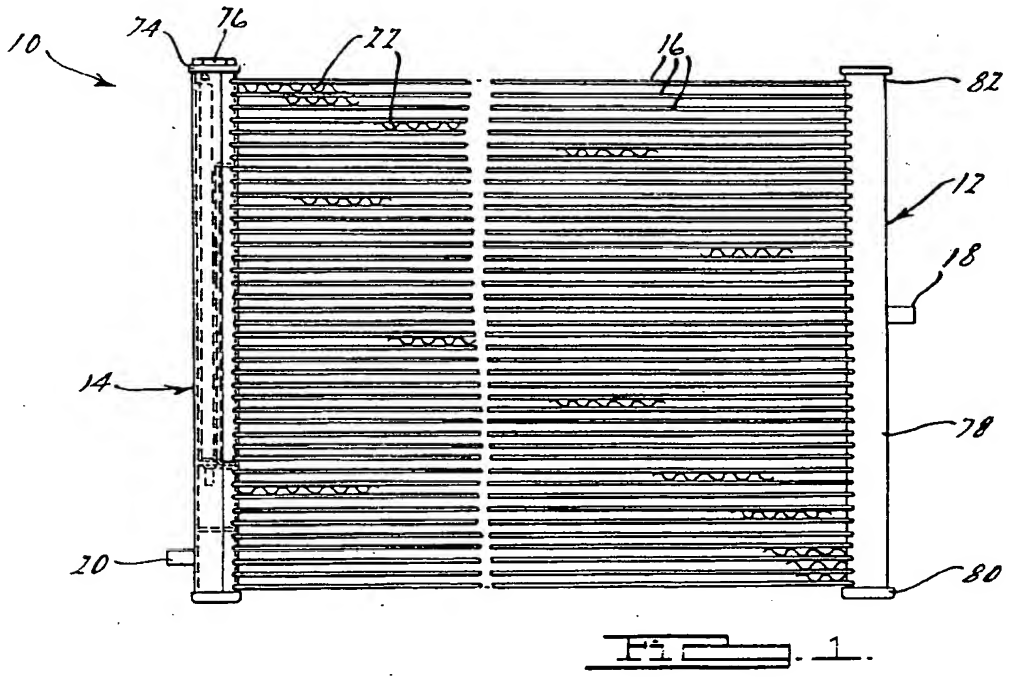

Fig. 1.

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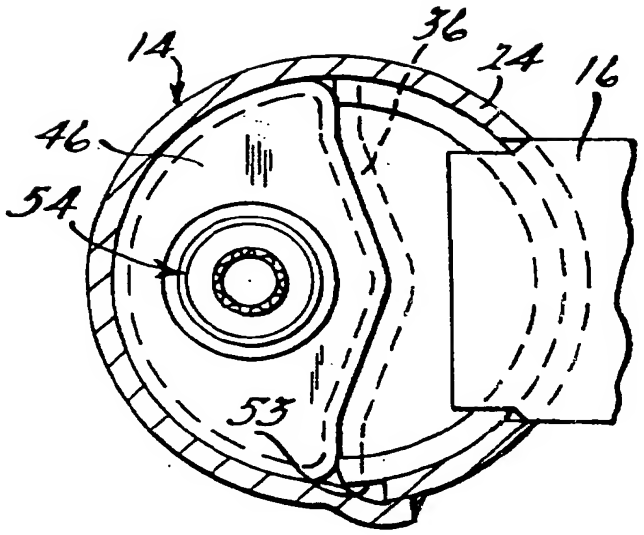


Fig. 4

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates generally to air conditioning systems for motor vehicles and, more specifically, to a condenser with an integral receiver dryer for an air conditioning system in a motor vehicle.

2. Description of the Related Art

[0002] It is known to provide a condenser for an air conditioning system in a motor vehicle. The condenser typically receives a fluid such as a refrigerant in a vapor phase, at a reasonably high temperature, and cools the vapor phase to transform it to a liquid phase. The condenser normally includes a plurality of tubes extending between opposite headers. The condenser also includes a plurality of cooling fins disposed between the tubes. One type cf condenser, often referred to as a multi-pass condenser, includes a plurality of baffles placed in one or both of the headers to direct the refrigerant through a plurality of flow paths. As the refrigerant flows in a back and forth pattern through the condenser, heat is transferred from the vapor phase of the refrigerant to condense to the liquid phase. The liquid phase continues to flow through the tubes of the condenser until it reaches an outlet where it is drawn off and used in the air conditioning system. When both liquid and vapor phases are present, continued flow of the liquid phase through the tubes decreases the overall efficiency of the condenser as the vapor phase is hindered from contacting and transferring heat to the tubes. Further, the liquid phase of the refrigerant occupies space within the tubes, thus reducing available interior surface area for heat transfer.

[0003] It is also known to provide a separate receiver dryer for storage of excess refrigerant from the condenser and to remove any moisture from the refrigerant in the air conditioning system. An example of a separate receiver dryer for a condenser in an air conditioning system is disclosed in U.S. Patent No. 5,755,113. In this patent, a separate receiver dryer fluidly communicates with a condenser. The receiver dryer includes a fluid inlet for receiving a two-phase refrigerant mixture from the condenser and two outlets, both of 'which direct refrigerant back to the condenser after phase separation. The receiver dryer also includes a quantity of desiccant material to remove moisture from the two-phase refrigerant mixture.

[0004] Other examples of receiver dryers used with condensers are disclosed in U.S. Patent Nos. 5,537,839, 5,546,761 and 5,666,791. However, these receiver dryers utilize separate containers, which are attached to the header or manifold of the condenser by various means. In some cases, the attached containers do not have the dryer material. Since the receiver dryer is a separate part, it requires additional space, fittings and brackets to attach it to the air conditioning system.

[0005] Although the above receiver dryers have worked well, it is desirable to incorporate a receiver dryer into a condenser. It is also desirable to incorporate a receiver dryer into a manifold of a condenser. It is further desirable to provide a condenser with a receiver dryer having fewer parts and compact installation. It is still further desirable to provide a condenser with a stamped manifold having an integral receiver dryer.

SUMMARY OF THE INVENTION

[0006] Accordingly, the present invention is a condenser having an integral receiver dryer including a first manifold, a second manifold, and a plurality of fluid carrying tubes extending between and in fluid communication with the first manifold and second manifold. The condenser also includes a receiver dryer disposed in and integral with one of the first manifold and second manifold. The first manifold or the second manifold is formed as a stamping having a generally arcuate shaped side extending axially and an edge of the side overlapping the side to form an interior chamber to receive fluid therein.

[0007] One advantage of the present invention is that a condenser with an integral receiver dryer is provided for an air conditioning system of a motor vehicle. Another advantage of the present invention is that the condenser has the receiver dryer incorporated into a manifold of the condenser that has been increased in diameter. Yet another advantage of the present invention is that the condenser has an integral receiver dryer in the manifold which has fewer parts and compact installation. Still another advantage of the present invention is that the condenser has an integral receiver dryer including a large single manifold and dryer material that perform as an integral receiver dryer. A further advantage of the present invention is that the condenser has an integral receiver dryer that includes a large single manifold that contains an integral deflector to direct refrigerant to upper passes of the condenser. Yet a further advantage of the present invention is that the condenser has a stamped manifold including dryer material that acts as a receiver dryer.

[0008] Other features and advantages of the present invention will be readily appreciated, as the same becomes better understood after reading the subsequent description taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

FIG. 1 is an elevational view of a condenser with an integral receiver dryer, according to the present in-

vention.

FIG. 2 is an enlarged fragmentary view of the condenser with integral receiver dryer of FIG. 1.

FIG. 3 is a sectional view taken along line 3-3 of FIG. 2.

FIG. 4 is a sectional view taken along line 4-4 of FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT (S)

[0010] Referring to the drawings and in particular FIG. 1, one embodiment of a condenser 10, according to the present invention, is shown for an air conditioning system (not shown) in a motor vehicle (not shown). The condenser 10 includes a pair of generally vertical, parallel first and second manifolds, an inlet manifold 12 and an outlet manifold 14 spaced apart a predetermined distance. The condenser 10 also includes a plurality of generally parallel, flat tubes 16 extending between the manifolds 12,14 and conducting fluid such as a refrigerant between them. The condenser 10 includes a fluid inlet 18 for directing the fluid into the condenser 10 formed in the inlet manifold 12 and a fluid outlet 20 for directing the fluid out of the condenser 10 formed in the outlet manifold 14. The condenser 10 also includes a plurality of convoluted or serpentine fins 22 disposed between the tubes 16 and attached to an exterior of each of the tubes 16. The fins 22 serve as a means for conducting heat away from the tubes 16 while providing additional surface area for convective heat transfer by air flowing over the condenser 10. It should be appreciated that the condenser 10 could be used as a heat exchanger in other applications besides motor vehicles.

[0011] Referring to FIGS. 2 through 4, the outlet manifold 14 is generally cylindrical in shape with a generally circular cross-sectional shape. The outlet manifold 14 has a diameter greater than the inlet manifold 12. The outlet manifold 14 is made of a metal material such as aluminum. The outlet manifold 14 has a side 24 extending axially, a closed end 26 at a bottom thereof and an open end 28 at a top thereof to form an interior chamber 30. The open end 28 may be threaded for a function to be described. The side 24 has a plurality of slots 32 extending therethrough and spaced axially to receive one end of the tubes 16. It should be appreciated that the tubes 16 are secured to the side 24 by suitable means such as brazing.

[0012] The condenser 10 also includes an integral receiver dryer, generally indicated at 35, disposed in the outlet manifold 14. The receiver dryer 35 includes a flow deflector 36 disposed in the interior chamber 30 to direct fluid to upper tubes 16 or passes of the condenser 10. The flow deflector 36 extends radially between and is secured to the side 24 by suitable means such as brazing to divide the interior chamber 30. The flow deflector 36 also extends axially and has a first or upper end 38 extending radially. The upper end 38 has a flange 39 extending axially and secured to the side 24 by suitable means such as brazing. The flow deflector 36 has a second or lower end 40 extending radially. The lower end 40 has a flange 42 extending axially and secured to the side 24 by suitable means such as brazing. The flow deflector 36 is made of a metal material such as aluminum. It should be appreciated that the flow deflector 36 is integral with the outlet manifold 14.

[0013] The receiver dryer 35 includes at least one, preferably a plurality of baffles 44 and 46 disposed in the interior chamber 30 to direct fluid in and out of the outlet manifold 14. The baffles 44 are generally planar and circular in shape. One of the baffles 44 is located axially between the outlet 20 and the flow deflector 36 The baffle 46 is located axially adjacent to the lower end 40 of the flow deflector 36. The baffle 46 is semicircular in shape and has a flange 48 extending axially. The flange 48 is secured to the side 24 and flow deflector 36 by suitable means such as brazing. The baffle 46 has a seat 50 extending axially and radially inwardly at an angle with an aperture 52 extending therethrough for a function to be described. The baffles 44 and 46 are made of a metal material such as aluminum. The baffles 44 and 46 are secured to the side 24 of the outlet manifold 14 by suitable means such as brazing. It should be appreciated that the baffles 44 and 46 are integral with the outlet manifold 14. It should also be appreciated that the aperture 52 may be covered with a filter (not shown) such as a screen if a dryer bag (not shown) containing dryer material is disposed in the outlet manifold 14.

[0014] In this embodiment, the flow deflector 36 is part of the original material for the side 24 of the outlet manifold 14. As a result, the side 24 and flow deflector 24 are integral, unitary and formed as one-piece. The side 24 and the flow deflector 36 are formed as a stamping by a conventional stamping process. The side 24 and flow deflector 36 are formed as a flat sheet and then the side is formed in an arcuate shape with the deflector 36 folded radially inwardly to contact the side 24. The flow deflector 36 may also be folded radially inwardly to form a general "V" cross-sectional shape. The edge of the side 24 is overlapped at the junction 53 where the flow deflector 36 is folded radially inwardly. The baffle 46 is formed with an inverted "V" shape along one side to complement the flow deflector 36. The side 24, flow deflector 36, baffles 44,46, and closed end 26 are secured together by suitable means such as brazing. It should be appreciated that the flow deflector 36, when folded into position, is in its desired location and remains there during handling and brazing. It should also be appreciated that the stamped side 24 and flow deflector 36 reduce manufacturing time of the outlet manifold 14 and ease assembly of the completed outlet manifold 14.

[0015] The outlet manifold 14 includes a dryer capsule, generally indicated at 54, disposed in the interior

chamber 30. The dryer capsule 54 is generally cylindrical in shape with a circular cross-section. The dryer capsule 54 includes a base 56 that is generally circular in shape. The base 56 has a plurality of apertures 57 extending radially therethrough. The dryer capsule 54 has a housing 58 extending axially and being generally cylindrical and tubular in shape. The housing 58 has a plurality of apertures 60 extending therethrough and a filter 62 such as a screen covering the apertures 60. The dryer capsule 54 includes a dryer material 63 such as a desiccant disposed in the housing 58. The dryer capsule 54 has a cap 64 closing the end thereof. The cap 64 may have a loop 66 attached thereto with an aperture 68 extending therethrough to allow a tool (not shown) to engage the loop 66 to remove the dryer capsule 54 from the outlet manifold 14. The dryer capsule 54 includes a seat portion 70 extending axially from the base 56 and having a general funnel shape. The dryer capsule 54 includes a filter 72 such as a screen extending axially from the seat portion 70. The filter 72 is generally cylindrical in shape to filter out particles in the fluid. The dryer capsule 54 is disposed in the interior chamber 30 of the outlet manifold 14 such that the seat portion 70 extends into the aperture 52 of the baffle 46. The housing 58, cap 64, base 56 and seat portion 70 are made of a rigid material such as plastic material.

[0016] Referring to FIG. 1, the outlet manifold 14 also includes an end closure 74 for closing the open end 28 thereof. The end closure 74 has a head 76 extending radially and a threaded shaft (not shown) extending axially. The end closure 74 may include a seal (not shown) disposed about the threaded shaft and adjacent the head 76. The threaded shaft engages the threaded open end 28 such that the seal engages the side 24 and the head 76 overlaps the side 24. The end closure 74 is made of a metal material such as aluminum and the seal is made of an elastomeric material such as rubber. It should be appreciated that the end closure 74 is removable to allow the dryer capsule 54 to be replaced. It should also be appreciated that the dryer capsule 54 is inserted into the outlet manifold 14 after the outlet manifold 14 is brazed and before the end closure 74 is in place.

[0017] The inlet manifold 12 is generally cylindrical in shape with a generally circular cross-sectional shape. The inlet manifold 12 is made of a metal material such as aluminum. The inlet manifold 12 has a side 78 extending axially, a closed end 80 at a bottom thereof and a closed end 82 at a top thereof to form an interior chamber. The side 78 has a plurality of slots (not shown) extending therethrough and spaced axially to receive one end of the tubes 16. The tubes 16 are secured to the side 78 by suitable means such as brazing.

[0018] The inlet manifold 12 includes at least one, preferably a plurality of baffles (not shown) disposed in the interior chamber to direct fluid in and out of the inlet manifold 12. The baffles are generally planar and circular in shape. The baffles are spaced axially and located approximately across from the baffles 44 and 46 of the outlet manifold 14 and the upper end 38 of the flow deflector 36 to define predetermined passes or loops of the condenser 10. The baffles are secured to the side 78 of the inlet manifold 12 by suitable means such as brazing. The baffles are made of a metal material such as aluminum. It should be appreciated that the baffles are integral with the inlet manifold 12.

In operation, fluid from the air conditioning system enters the condenser 10 through the inlet 18 on the inlet manifold 12. The baffles and flow deflector 36 direct or route the fluid through a first pass of thirteen (13) tubes 16 and a second pass of nine (9) tubes 16 and into an upper pass of seven (7) tubes of the condenser 10. The fluid flow enters the outlet manifold 14 at the top. The condensed liquid fluid, being of a greater density, drops over the dryer capsule 54 and to a lower portion of the outlet manifold 14, creating a liquid seal. The condensed liquid fluid passes through the dryer capsule 54 and filter 72 and enters a first pass of six (6) tubes 16 of a subcooling loop. The condensed liquid fluid reverses and passes through a second pass of six (6) tubes 16 of the subcooling loop, into the lower part of the outlet manifold 14 and through the outlet 20 and on to an evaporator (not shown) of the air conditioning system. It should be appreciated that the number of tubes 16 per pass or loop may be varied.

[0019] The present invention has been described in an illustrative manner. It is to be understood that the terminology which has been used is intended to be in the nature of words of description rather than of limitation.

[0020] Many modifications and variations of the present invention are possible in light of the above teachings. Therefore, within the scope of the appended claims, the present invention may be practiced other than as specifically described.

Claims

1. A condenser comprising:

   a first manifold;
   a second manifold spaced from and opposing said first manifold;
   a plurality of fluid carrying tubes extending between and in fluid communication with said first manifold and said second manifold; and
   a receiver dryer disposed in and integral with one of said first manifold and said second manifold, said one of said first manifold and said second manifold being formed as a stamping having a generally arcuate shaped side extending axially and an edge of said side overlapping said side to form an interior chamber to receive fluid therein.

2. A condenser as set forth in claim 1 including at least

one baffle positioned within the one of said first manifold and said second manifold and cooperating with said tubes to form a plurality of fluid flow passes, each flow pass having a plurality of said tubes associated therewith.

3. A condenser as set forth in claim 1 wherein said receiver dryer includes a flow deflector being disposed in the one of said first manifold and said second manifold and being formed as one-piece.

4. A condenser as set forth in claim 1 wherein said receiver dryer includes a dryer material disposed in the one of said first manifold and said second manifold.

5. A condenser as set forth in claim 3 wherein said flow deflector is folded radially inward from said side.

6. A condenser as set forth in claim 5 wherein said side and said flow deflector are formed as a stamping.

7. A condenser as set forth in claim 5 wherein said side and said flow deflector are made of a metal material.

8. A condenser as set forth in claim 3 wherein said receiver dryer includes at least one baffle disposed in the one of said first manifold and said second manifold adjacent a lower end of said flow deflector.

9. A condenser as set forth in claim 1 including a dryer capsule and a dryer material disposed in said dryer capsule.

10. A condenser as set forth in claim 9 wherein said dryer capsule comprises a housing having a plurality of apertures extending therethrough.

11. A condenser as set forth in claim 10 wherein said dryer capsule includes a filter covering said apertures.

12. A condenser as set forth in claim 1 wherein the one of said first manifold and said second manifold is the outlet manifold and the other is the inlet manifold.

13. A condenser as set forth in claim 12 wherein said outlet manifold has a diameter greater than said inlet manifold.

14. A condenser for an air conditioning system of a motor vehicle comprising:

an inlet manifold;
an outlet manifold spaced from and opposing said inlet manifold;
a plurality of fluid carrying tubes extending between and in fluid communication with said inlet manifold and said outlet manifold; and
said outlet manifold formed as a stamping having a generally arcuate shaped side extending axially and an edge of said side overlapping said side to form an interior chamber with a diameter greater than said inlet manifold and including a dryer material disposed in said interior chamber of said outlet manifold to act as a receiver dryer.

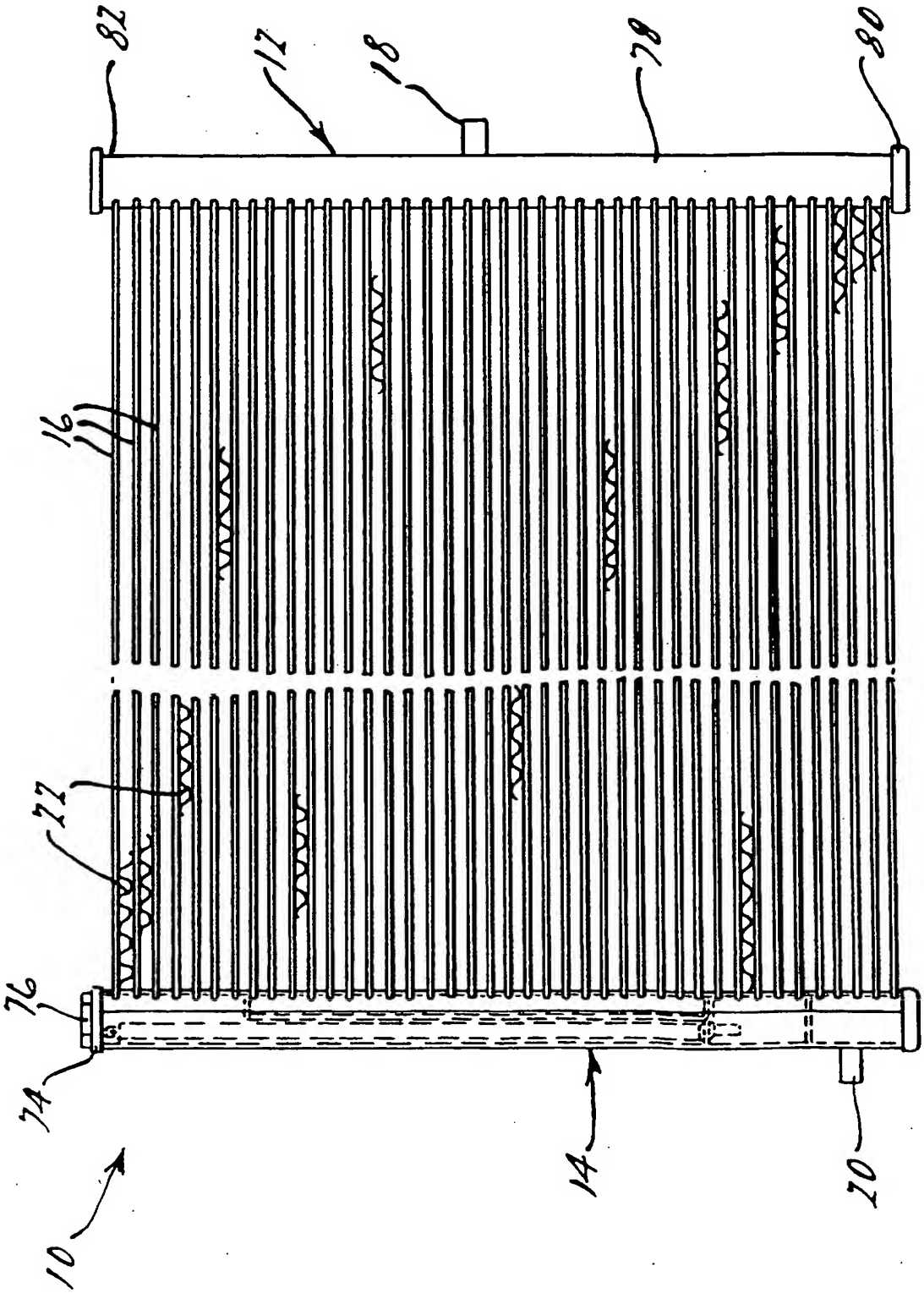
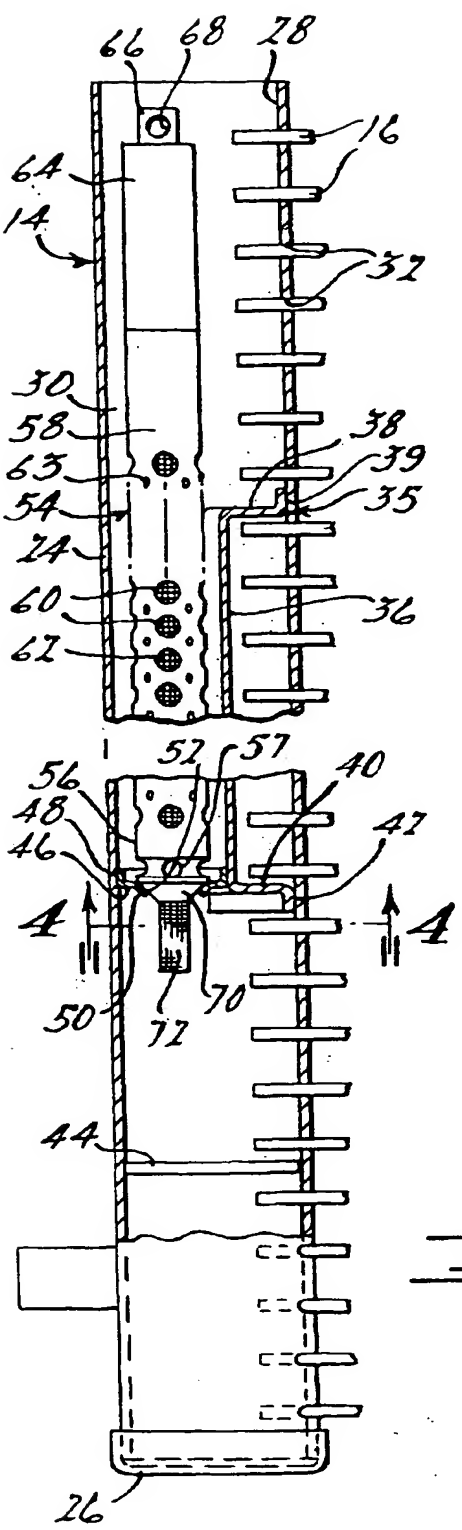


Fig. 1.



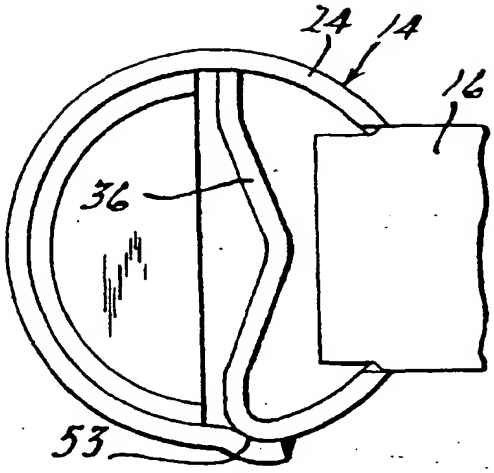


Fig. 3.

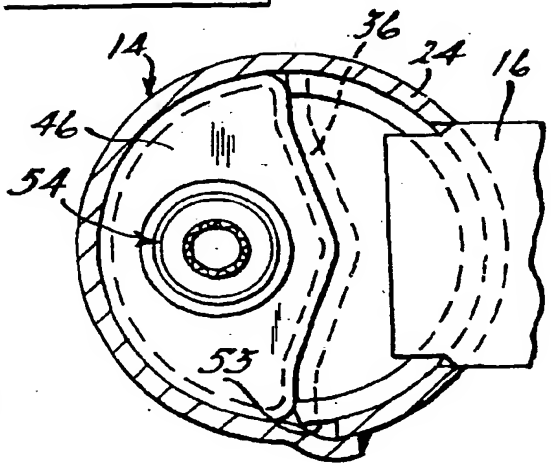


Fig. 4.

Fig. 2.

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 00 30 8960

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	12 March 2001	Yousufi, S

CATEGORY OF CITED DOCUMENTS

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